

STRUCTURAL MEMBRANES FOR URBAN SPACES

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Summary. The applications and possibilities of structural membranes for urban space conditioning are explored on the basis of traditional examples and recent experiences

1 INTRODUCTION

Although traditional architecture resorted frequently to textile roofs in urban spaces, the latest innovations in materials and technology of structural membranes are being mostly applied to building envelopes rather than the conditioning of urban spaces. However, most urban spaces are being recovered for many other uses besides private vehicular traffic, as they typically were used for in the past.

Structural membranes are very well suited to create outstanding environmentally-conditioned spaces amongst the urban fabric because they are adaptable, flexible, light and open in such a way that they do not interfere with the spatial continuity. They can be isolated, in combination, filling gaps or providing continuation of existing patterns. Their role as intermediate spaces is provided by means of translucency, even transparency, natural light and artificial lighting characteristics. In addition, their curvilinearity facilitates the adaptation to the regular geometry of streets or squares and irregularities that occur in many urban situations, and are enhanced by soft and curved borders, the significance of ceilings, the mutual correspondence between structure and space, and the readability of the shape.

However, these features have to be tuned to different situations that occur in the city, so that a typology of urban spaces aimed at the architectural possibilities or being conditioned by structural membranes is established. The initial approach presented by the author in a previous paper [4] has been updated to include open and monumental squares, traffic and pedestrian streets, boulevards, avenues, city parks, river banks, sea fronts and piers. This approach permits the checking for appropriateness of structural membranes for conditioning urban spaces by analysing recent interventions.

2 ANTECEDENTS

Textile roofs have been used in cities since their beginnings. In fact, they occasionally date back to the city's origins (figures 1 to 3).



Figures 1 to 3: Roman Camp, Mina Tent City and Tunisia Tent City.



Figures 4 to 6: Sevilla Fair, Maestra Street, Jaén, and Virgen Square, Valencia

Background examples of textile conditioning of urban spaces which are still in use are open-air markets and fairs, the decorating of streets for celebrations of popular festivals and solar protection (figures 4 to 6).

3 URBAN SPACES

According to R.Krier [3] urban spaces are all types of space left between buildings usually seen as open and unobstructed. Their qualities are characterised by the general configuration, the geometry, the range of the visuals, what they are to be used for, transportation and pedestrian routes, the surrounding buildings, the presence of monuments, sculptures, fountains, street furniture, facilities and traffic flow. Activities which take place in urban spaces are multiple: travelling to work, shopping, selling goods, recreation, leisure, sports, etc. Clearly, geometric urban spaces call for architecture of high quality because any architectural error is immediately obvious and detracts from the overall visual impression.

3.1 Typology

Aiming at their conditioning, the following basic types of urban spaces included in table 1 can be considered: squares (open, monumental, traffic islands), streets (avenues, boulevards, arcaded, pedestrian or open to the traffic) and open spaces (planned such as city parks, sea fronts, docks and river banks or unplanned).

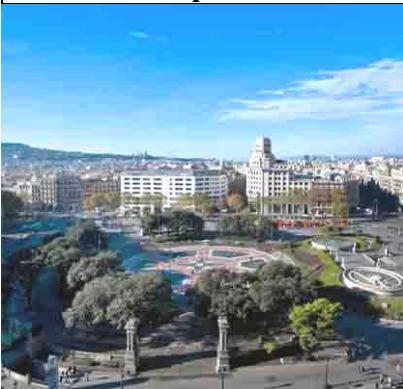









| SQUARES | | | |
|---|---|--|--|
| Open | Monumental | Traffic islands | |
|  |  |  | |
| Catalunya Square, Barcelona | Real Square, Barcelona | F. Macià Square, Barcelona | |
| STREETS | | | |
| Avenues and Boulevds. | Arcaded | Pedestrian | Open to traffic |
|  |  |  |  |
| Rambles, Barcelona | Kramgasse, Bern | Sierpes Street, Sevilla | 5th Avenue, NYC |
| OPEN SPACES | | | |
| City parks | Unplanned | Sea fronts, docks, river banks | |
|  |  |  | |
| Central Park, New York City | | Naviglio Grande, Milano | |

Table 1: Urban space typology

3.2 Squares

Squares are produced by the grouping of buildings around an open space. Original functions included markets, parades, ceremonies, festivals, dances among other social activities, particularly those held in front of churches and town halls. They are open, monumental or traffic islands according to the contribution of the surrounding buildings and urban layout. Well known monumental main squares of historic cities are the "Grand Place", Brussels; Piazza del Campo, Siena; Places Vendôme and des Vosges, Paris; Plaza Mayor, Madrid; or Plaza Real, Barcelona.

3.3 Streets

Streets tend to be more functional and less attractive places than squares to pass the time because of the bustle of traffic, so they rarely operate as autonomous isolated spaces. They are avenues, boulevards, arcaded, pedestrian, or are mainly used for traffic. Nevertheless, there is a growing interest in their recovery as public spaces for pedestrians, as can be seen in many transformation projects that have been executed recently (figure 7).



Figure 7: Copenhagen city centre progressively recovered for pedestrians (1962-2000) [1]

3.4 Open spaces

Open spaces are not configured by surrounding buildings. City parks and ordered open spaces, sea fronts, and river banks require the characteristics of the park itself or the organisation to be taken into account, so that they are not altered substantially. Nevertheless, unplanned urban spaces allow for any type of intervention, which may be autonomous or could be used to provide structure or order the enclosure (figures 8 and 9).

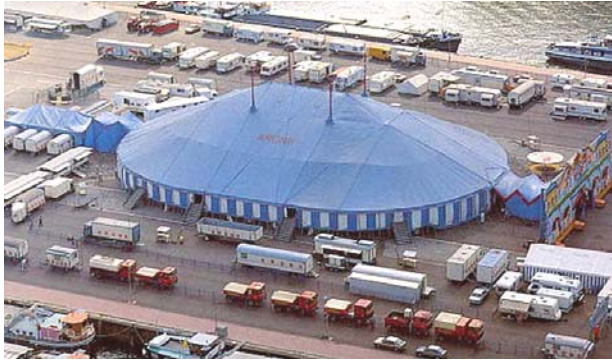


Figure 8: Circus Krone tent installed on open spaces.

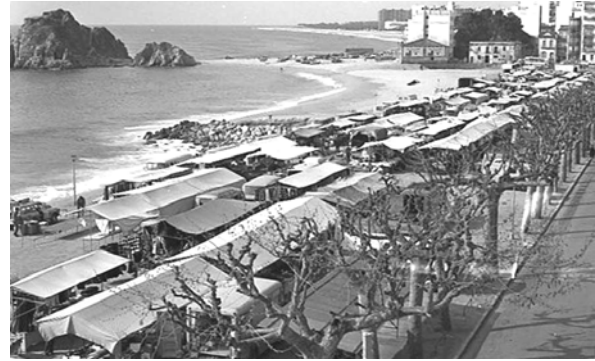


Figure 9: Open air markets tend to structure the surrounding space.

4 URBAN APPLICATIONS OF MEMBRANES

The main applications of structural membranes to the conditioning of urban space are the creation of atmosphere, delimitation and protection. They maintain the space's character because they do not configure fully-enclosed volumes which obstruct visuals, thus interrupting the continuity. In addition, they can be removed easily leaving no trace, so they do not irreversibly compromise the places where they are installed. The relevance of maintaining the continuity of visuals and use in order to preserve the area's urban character should be emphasized. Otherwise, the intervention converts into a building which reduces and interrupts the urban space (figures 10 to 12).



Figure 10: A fully enclosed pavilion in the Albacete Park, 2000. It is not more a urban space. It is a building in the middle of the park



Figure 11: A fully enclosed pavilion in the Kléber Square, Strasbourg. It is a building in the middle of the square.



Figure 12: The Southstreet Seaport Pavilion NYC is open. It frames the views. The urban space is not interrupted.

4.1 Approaches

Conditioning the urban space may be tailored to the needs of a specific location (i.e. a particular design is needed) or may be adapted for standardized modular prototypes planned for different sites that are independent of the location. On the other hand, there are situations where the context is crucial (e.g. the new construction is required to fill in a gap or continue an existing pattern), while others allow for independent free-standing solutions. Combining both criteria, a typology of interventions in the urban space is established (table 2).






| | Tailored to the needs of a specific location | Modular | |
|---|---|--|--|
| Free-standing |  |  | |
| | Expo Brisbane 1988 | High peak tension tent. Anchor modules | |
| |  |  | |
| | FTL, 1991: Pier Six Concert Pavilion, Baltimore | SL-Rasch: Medina Haram Piazza | |
| Linked, connected or supported by the surrounding buildings |  |  |  |
| | Luksor temple, 1500 bC | Glyndebourne Opera | Pope visit, Terracina, 1795 (IL 5) |
| |  |  | |
| | R.Piano, 1984: Schlumberger renovation, Paris | Rovinj, 1994 | |

Table 2: Approaches to the conditioning of the urban space

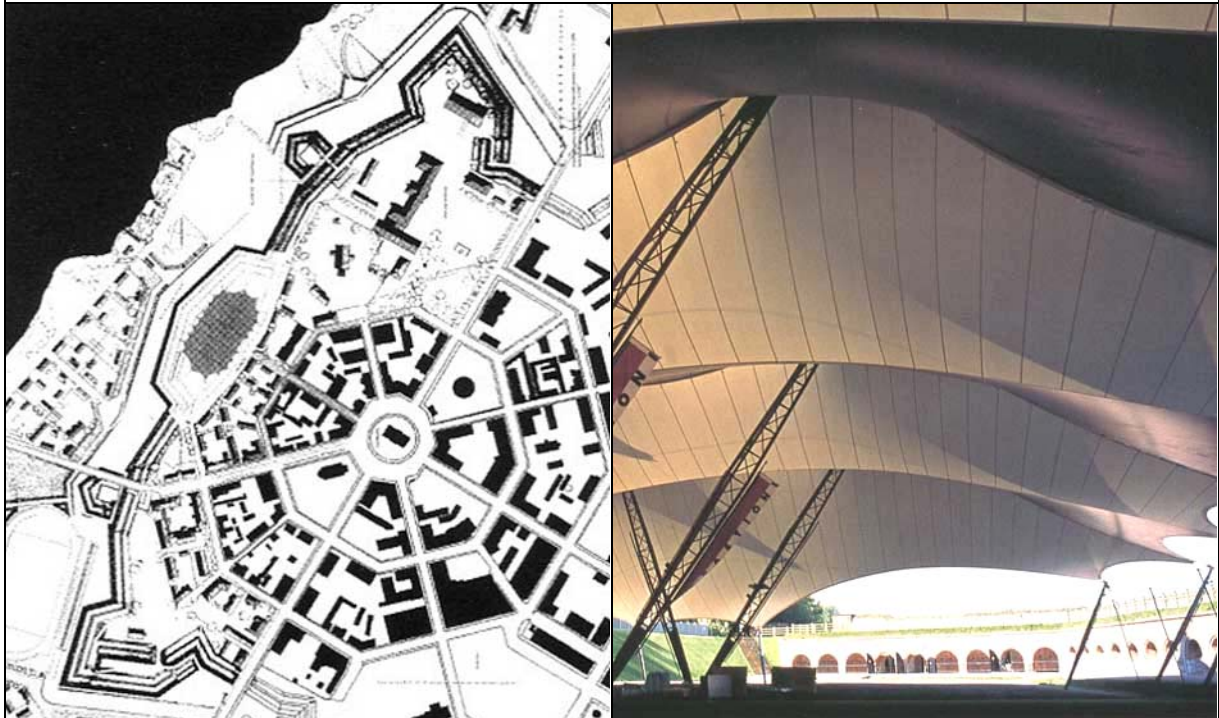
Case study 1: S.Tijner, 1998: Urban-LoritzPlatz, Vienna

Street open to traffic



Case study 2: R.Mänttär, 1998: Hamina Central Bastion [1]

Open space



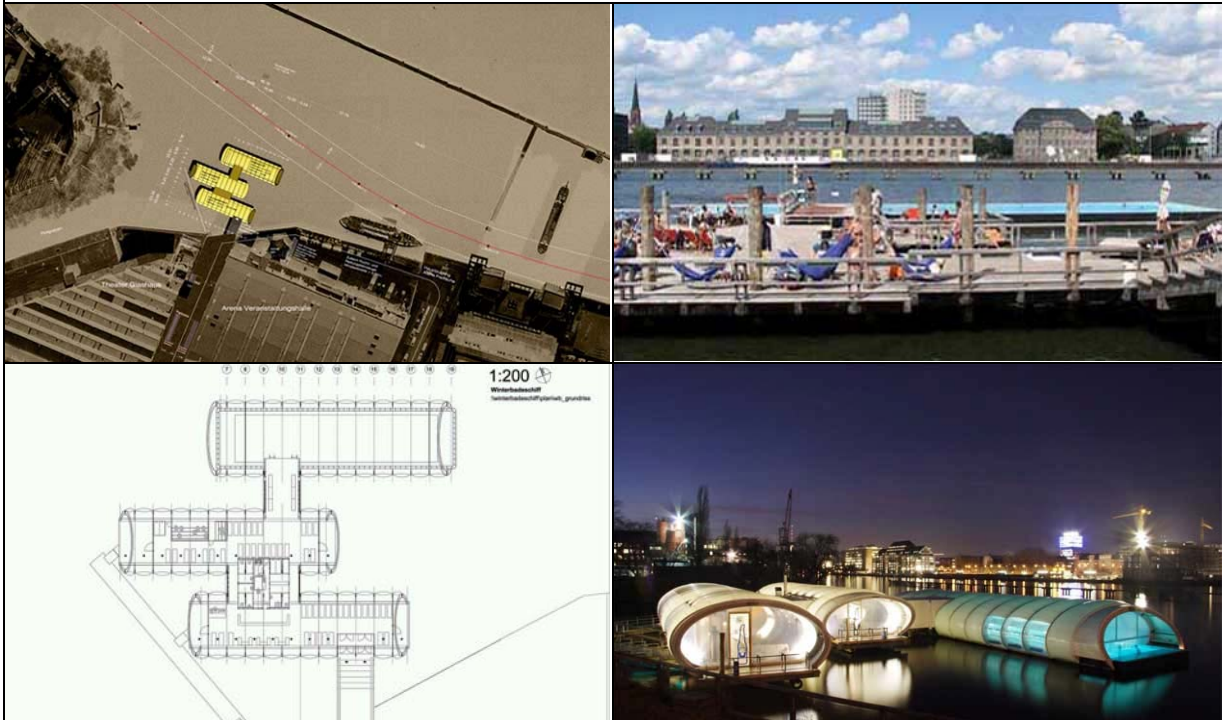
Case study 3: Build Air Pavilion, Moll de la Fusta, Barcelona, 2004

Sea front



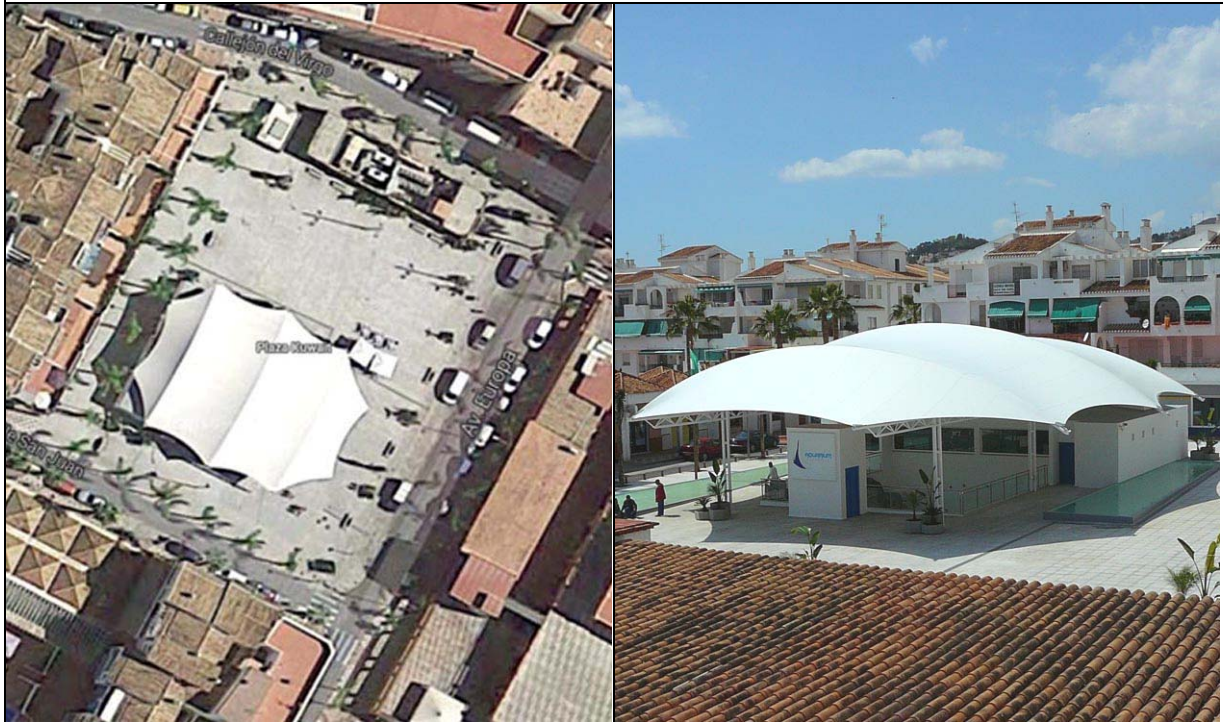
Case study 4: Wilk-Salinas Architekten, 2005: Berlin Badeschiff

River bank



Case study 5: Arqintegral & J.Llorens, 2007: Almuñecar Aquarium

Square



Case study 6: F.Escrig & J.Sánchez, 2008: Textile River, Zaragoza

Avenue



Case study 7: SBA Architekten, 2010: Expo Axis, Shanghai

Avenue



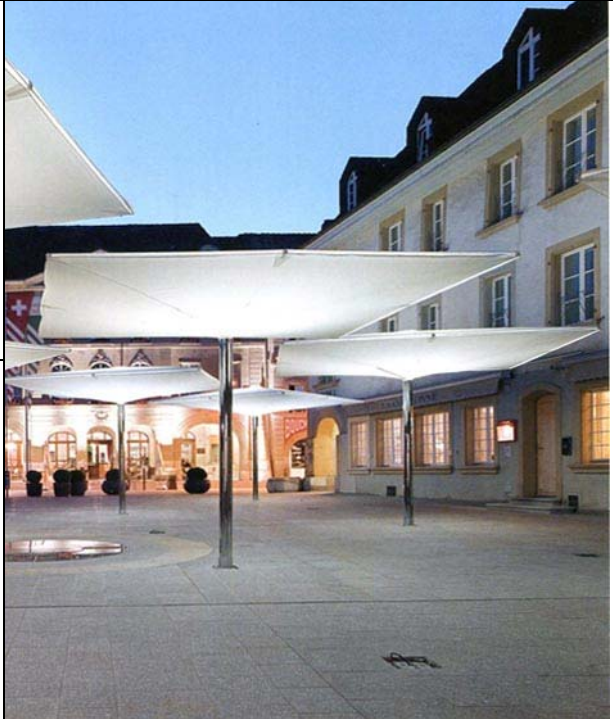
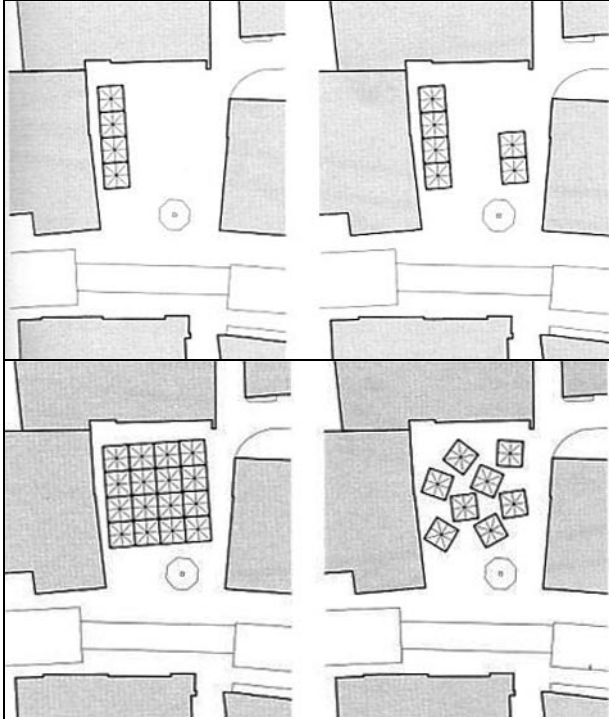
Case study 8: M.Heinsdorff, 2012: Year of Germany in India pavilions

Open space



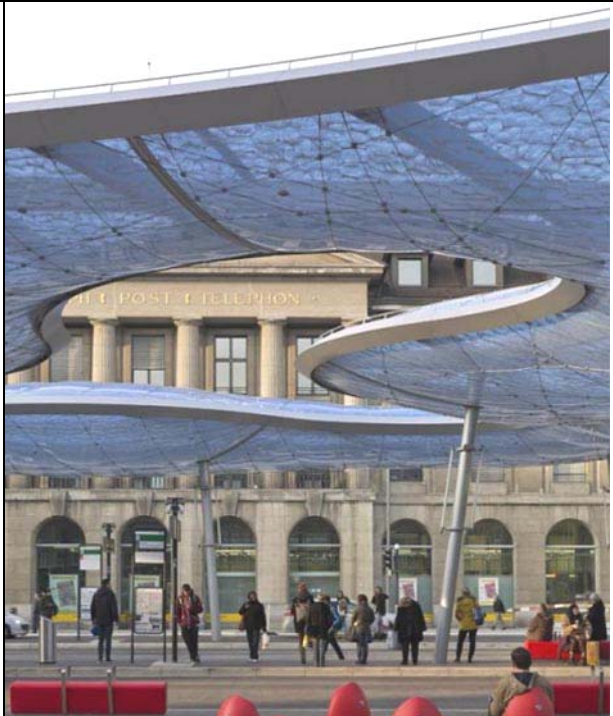
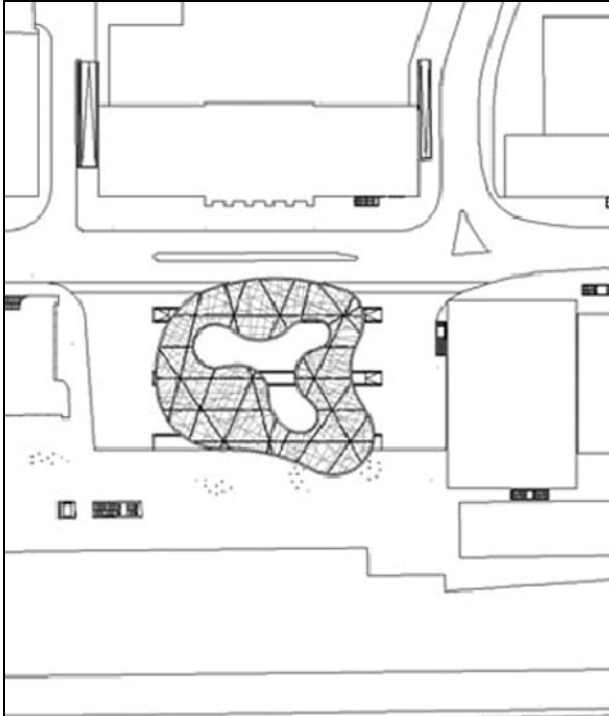
Case study 9: F.Jud Architekten, 2013: Market Square, Avenches

Square



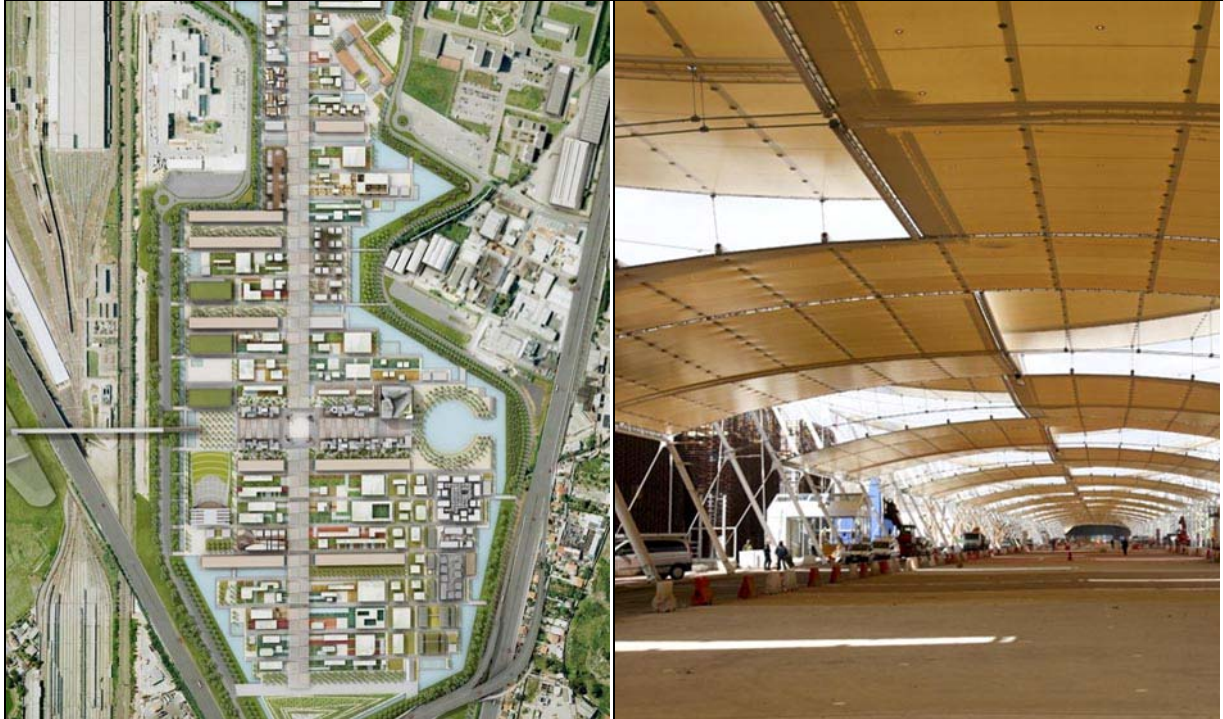
Case study 10: Vehovar & Jauslin, 2013: Aarau Bus Station

Square



Case study 11: M.Majowiecki, 2015: Cardo and Decumano Avenues, Expo Milano

Avenue



12 CONCLUSIONS

- Structural membranes are appropriate for conditioning urban spaces. They provide atmosphere, protection and delimitation. They maintain openness and usefulness, while at the same time do not consolidate closed volumes, because they are easily removable leaving no trace behind.
- Urban spaces have been classified according to their requirements and a diversity of solutions has been recognized.
- These directives ought to be considered in the design, for the analysis of projects and production and to avoid the construction of closed buildings located in the middle of a street, square or open space, completely ignoring the surrounding atmosphere.

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